Letter to the Editor[†]

The Induction of Apoptosis by Laser: A New Therapeutic Modality

Dr. Jiri T. Beranek is to be congratulated on drawing the attention of clinicians to the fact that another form of cell death may occur following laser treatment other than by necrosis.

In the treatment of uterine leiomyomas by low power laser-induced interstitial thermotherapy (LITT), I was struck by the absence of complications so much in evidence if high power laser were used, by the slow disappearance of the tumour over the course of several months, by the lack of growth of residual tumour under the influence of pregnancy or hormone replacement therapy, and, finally, by the subsequent lack of scar tissue and the presence of giant cells.

Although immediate histological findings after LITT demonstrated a central cavity of vaporization surrounded by a zone of necrosis and a further outer zone of coagulation and although laser heat is known to cause destruction of nearby blood vessels and consequent anoxia of adjacent cells, nevertheless, this cannot explain the slow, painless disappearance of the tumour bulk, the absence of massive necrosis, the presence of giant cells, and the ultimate absence of scarring.

Necrotic cell death is characterised by rapid cell swelling and lysis, something that obviously does not occur to any appreciable extent in the treatment of uterine leiomyomas by LITT. I have shown that, in the wider outer zone heated but not coagulated by the centrally placed laser fibre, the epidermal growth factor and hormone receptors are destroyed [1]. It has further been demonstrated that certain enzymes are also destroyed [2]. Many scientists have shown that cell survival appears to depend on the constant supply of survival signals provided by neighbouring cells and the extra cellular matrix [3], but in patients treated by LITT these, too, must have been damaged by the laser heat. All the above are capable of inducing apoptosis in which controlled autodigestion occurs followed by phagocytic removal. The latter could explain the presence of giant cells at the site of the tumour previously treated by LITT. In other words, although Beranek's hypothesis that LITT induces apoptosis cannot be accepted in its entirety, it would appear to be the major factor involved.

Unfortunately, uterine leiomyomas are unique to homosapiens, and it would be unethical to carry out detailed chronological histopathological studies over the course of several months to confirm this. However, tumours in other organs, in particular the liver, can be studied in animals, and I agree that this should be done, preferably in large animals such as pigs.

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[†]This is a reply to Dr. Beranek's Letter to the Editor, which was published in LSM 23:65 (1998).